

Claims

- [c1] A multilayer structure, comprising:
a silicide layer having a first surface;
an oxide layer, on the first surface and having a second surface, with an opening through the oxide layer defined by an opening wall extending from the second surface to the first surface;
a liner layer on the first surface at a bottom of the opening;
silicon layer means extending over an entirety of the second surface, the opening surface, and the liner layer for preventing the silicide layer from interacting with any fluorine that may be present; and
a refractory material layer on the continuous silicon layer means and substantially filling the opening.
- [c2] The structure according to claim 1, wherein the silicon layer means comprises a continuous polysilicon layer that has a thickness not greater than about 50Å.
- [c3] The structure according to claim 1, wherein the silicon layer means comprises a continuous amorphous silicon layer that has a thickness not greater than about 50Å..

- [c4] The structure according to claim 1, wherein the refractory material layer comprises a metal selected from a group of refractory metals consisting of titanium, tantalum molybdenum and tungsten
- [c5] The structure according to claim 4, wherein the refractory material comprises the selected metal deposited as a metal, as a component of a nitride of the metal, or as a component of an alloy of the metal.
- [c6] The structure according to claim 1, wherein the silicon layer means sacrificially protects the underlying liner layer and the silicide layer from any reaction with any fluorine that may be present.
- [c7] The structure according to claim 1, wherein the silicon layer means comprises a nucleation layer for deposition of the refractory material layer thereon.
- [c8] A multilayer structure obtainable by a method of filling an opening in an oxide layer over a liner layer formed on a surface of a silicide substrate underlying both the oxide layer and the liner layer, wherein the method comprises:
forming a first continuous sacrificial layer comprising silicon, by either physical vapor deposition (PVD) or chemical vapor deposition (CVD) at a first temperature in

the range 500C to 650C completely covering the oxide layer and the liner layer;
forming a second layer, comprising a refractory material, on the first continuous sacrificial layer at a second temperature that is lower than the first temperature so as to cover the first layer and to also substantially fill the opening; and
during said forming a second layer, sacrificing at least a portion of the first continuous sacrificial layer, wherein said sacrificing at least a portion of the first continuous sacrificial layer ensures against a deterioration of the silicide substrate underlying both the oxide layer and the liner layer.

- [c9] The multilayer structure according to claim 8, wherein the first continuous sacrificial layer is a continuous layer of one of amorphous or polycrystalline that has a thickness not greater than about 50Å.
- [c10] The multilayer structure according to claim 8, wherein the first temperature is approximately 600C.
- [c11] The multilayer structure according to claim 8, wherein the refractory material contains a metal selected from a group of refractory metals consisting of titanium, tantalum, molybdenum and tungsten.

- [c12] The multilayer structure according to claim 11, wherein the refractory material comprises one of the selected metals deposited as a metal, as a component of a nitride of the metal, or as a component of an alloy of the metal.
- [c13] The multilayer structure according to claim 8, wherein the first continuous sacrificial layer sacrificially protects the underlying liner and the silicide substrate underlying both the oxide layer and the liner layer during the step of forming the second layer.
- [c14] The multilayer structure according to claim 13, wherein the first continuous sacrificial layer serves as a nucleation layer for deposition of the second layer thereon.
- [c15] The multilayer structure according to claim 8, wherein the first continuous sacrificial layer is formed by a chemical vapor deposition (CVD) process and extends continuously on the oxide layer, a wall of the opening and the liner layer.
- [c16] The multilayer structure according to claim 8, wherein the liner layer comprises at least one of titanium, titanium nitride, tungsten, and an alloy of titanium and tungsten.
- [c17] The multilayer structure according to claim 8, wherein said silicide substrate comprises a silicide layer on a sili-

con substrate.

- [c18] The multilayer structure according to claim 8, wherein the second layer is formed from a fluorine containing compound.
- [c19] The multilayer structure according to claim 18, wherein the fluorine containing compound comprises WF_6 .
- [c20] A multilayer structure, comprising:
a fluorine-free silicide layer having a first surface;
an oxide layer, on the first surface and having a second surface, with an opening through the oxide layer defined by an opening wall extending from the second surface to the first surface;
a liner layer on the first surface at a bottom of the opening;
a silicon layer containing fluorine extending over an entirety of the second surface, the opening surface, and the liner layer; and
a refractory material layer on the silicon layer which substantially fills the opening,
wherein the refractory material layer is obtained from a fluorine-containing compound.